

FLOOD HAZARDS AND FLOOD CLEAN UP OPERATIONS GUIDE FOR KYARNG PERSONNEL

Military personnel, workers and volunteers involved with floods and flood cleanup work should be aware of the potential dangers involved and the proper safety precautions. Because the level of experience varies among these workers, cleanup crews must work together and look out for one another to ensure safety. Good communication and situational awareness is key to avoiding accidents. Remember to perform your risk assessments.

The work-related hazards listed here are described in greater detail on the subsequent pages: Electrical Hazards, Carbon Monoxide, Musculoskeletal Hazards, Thermal Stresses, Heavy Equipment, Structural Instability, Hazardous Materials, Fire, Drowning, Confined Spaces, Power Line Hazards, Agricultural Hazards, Stress, Flash Flooding, Personal Protection Equipment, Chemicals and Waste Hazards in Flood Waters, Displaced Wild Life, Pets and Farm Animals, Communication and Accountability of (command and control) of Deployed Personnel, Mosquitoes, Dealing With Irate Public and Fatigue.

Flash Floods:

Flash floods can strike any time and any place with little or no warning. In mountainous or flat terrain, distant rain may be channeled into rivers and gullies, turning a quiet streamside campsite or wash into a rampaging torrent in minutes. City streets can become rivers in seconds.

In looking at the statistics, another fact becomes apparent. Most flood-related deaths occur in automobiles. Sadly, many of these fatalities were avoidable. In many cases, if the driver had turned around instead of driving onto a flooded roadway, one or more lives would have been spared.

The reason for the high number of automobile-related deaths is that moving flood waters contain an incredible amount of force. For each foot of flood water, 1500 pounds of an automobile's weight is displaced. This means that two feet of water has more than enough energy to send most automobiles floating helplessly downstream.

Escaping from a vehicle once flood waters have carried it away is very difficult, and in some cases nearly impossible. Among the problems: water pressure on the outside of the vehicle prevents occupants from opening doors; the vehicle could overturn into a ditch or ravine and become inundated; and even if a person were able to get out of the vehicle, the

strong current and undertow of the flood waters would likely be too much to overcome in attempting to swim to safety.

The safest practice during a flood or flash flood is to avoid driving onto water-covered roadways, even if the water depth appears low. Water depth is very difficult to estimate on roads, especially at night, when many flood deaths occur. Also, in the case of a flash flood, waters rise very quickly. Water that covered a road by only 6 inches at one moment could easily be 2 to 3 feet deep just seconds later!

Observe these flash flood safety rules. They could save your life:

- Keep alert for signs of heavy rain (thunder and lightning), both where you are and upstream. Watch for rising water levels.
- Know where high ground is and get there quickly if you see or hear rapidly rising water.
- Be especially cautious at night. It's harder to recognize the danger then.
- Do not attempt to cross flowing water which may be more than knee deep. If you have doubts, don't cross.
- Don't try to drive through flooded areas. Know the limitations of your tactical vehicles.
- If your vehicle stalls, abandon it and seek higher ground immediately.
- During threatening weather listen to commercial radio or TV, or NOAA Weather Radio for Watch and Warning Bulletins.
- Know your evacuation routes. The road you drove into an area earlier in the day, may not be passable to exit from.

Flash Flood Watch means it is possible that rains will cause flash flooding in the specified area. Be alert and prepared for a flood emergency.

Flash Flood Warning means flash flooding is occurring or is imminent in the specified area. Move to safe ground immediately.

Drowning:

When entering moving water, you are at risk for drowning, regardless of your ability to swim. Because those in vehicles are at greatest risk of drowning, it is important to comply with all hazard warnings on roadways and to avoid driving vehicles or heavy equipment into water of an unknown depth. Avoid working alone and wear a Coast Guard-approved life jacket when working in or near flood waters.

Electrical Hazards:

To prevent future electrocutions, those involved in cleanup activities to take the following steps:

If water has been present anywhere near electrical circuits and electrical equipment, turn off the power at the main breaker or fuse on the service panel. Do not turn the power

back on until electrical equipment has been inspected by a qualified electrician. Never enter flooded areas or touch electrical equipment if the ground is wet, unless you are certain that the power is off. **NEVER** handle a downed power line.

When using gasoline and diesel generators to supply power to a building, switch the main breaker or fuse on the service panel to the "off" position prior to starting the generator. This will prevent inadvertent energization of power lines from backfeed electrical energy from the generators, and help to protect utility line workers from possible electrocution.

If clearing or other work must be performed near a downed power line, contact the utility company to discuss de-energizing and grounding or shielding of power lines. Extreme caution is necessary when moving ladders and other equipment near overhead power lines to avoid inadvertent contact. If you are working on or near power lines, refer to the additional recommendations provided in that section below.

Carbon Monoxide:

Flood cleanup activities may involve the use of gasoline- or diesel-powered pumps, generators, and pressure washers. Because these devices release carbon monoxide, a deadly, colorless, odorless gas, operate all gasoline-powered devices outdoors and **never** bring them indoors. It is virtually impossible to assess adequate ventilation. Several carbon monoxide poisoning deaths in the past have been caused by the use of gasoline-powered engines indoors or in confined spaces.

Musculoskeletal Hazards:

Cleanup workers are at risk for developing serious musculoskeletal injuries to the hands, back, knees, and shoulders. Special attention is needed to avoid back injuries associated with manual lifting and handling of debris and building materials. To help prevent injury, use teams of two or more to move bulky objects, avoid lifting any material that weighs more than 50 pounds (per person), and use proper automated-assist lifting devices.

Thermal Stresses:

Heat

Cleanup workers are at serious risk for developing heat stress. Excessive exposure to hot environments can cause a variety of heat-related problems, including heat stroke, heat exhaustion, heat cramps, and fainting. To reduce the potential for heat stress, drink a glass of fluid every 15 to 20 minutes and wear light-colored, loose-fitting clothing. Additionally, incorporate work-rest cycles into work routines, work during the cooler hours of the day, when possible, or distribute the workload evenly throughout the day. When air conditioning is unavailable, open windows and use fans.

Cold

Standing or working in water which is cooler than 75 degrees F (24 degrees C) will remove body heat more rapidly than it can be replaced, resulting in hypothermia. To reduce the risk of hypothermia, wear high rubber boots, ensure that clothing and boots have adequate insulation, avoid working alone, take frequent breaks *out of the water*, and change into dry clothing when possible.

Heavy Equipment:

Only those properly trained should operate heavy equipment such as bulldozers, backhoes, and tractors. If you are operating this type of equipment, turn it off and block it against motion prior to dismounting for any reason.

Structural Instability:

Flood waters can rearrange and damage natural walkways, as well as sidewalks, parking lots, roads, buildings, and open fields. Never assume that water-damaged structures or ground are stable. Buildings that have been submerged or have withstood rushing flood waters may have suffered structural damage and could be dangerous. Don't work in or around any flood-damaged building until it has been examined and certified as safe for work by a registered professional engineer or architect. Assume all stairs, floors, and roofs are unsafe until they are inspected. Leave immediately if shifting or unusual noises signal a possible collapse.

Hazardous Materials:

Flood waters can dislodge tanks, drums, pipes, and equipment, which may contain hazardous materials such as pesticides or propane. Do not attempt to move unidentified dislodged containers without first contacting the local fire department or hazardous materials team. If working in potentially contaminated areas, avoid skin contact or inhalation of vapors by wearing appropriate protective clothing and respirators. Frequently and thoroughly wash skin areas that may have been exposed to pesticides and other hazardous chemicals.

Fire:

Fire can pose a major threat to an already badly damaged flood area for several reasons: inoperative fire protection systems, hampered fire department response, inoperable firefighting water supplies, and flood-damaged fire protection systems. Workers and employers must therefore take extra precautions. At least two fire extinguishers, each with a UL rating of at least 10A, should be provided at every cleanup job.

Communication and Accountability of (command and control) of Deployed Personnel:

It will be necessary to send small teams of individuals out to remote areas alone, due to the nature of the emergency and mission demands. There may not be enough radios to issue to each team and telephones (even cell phones may not work) are not always reliable. Remember to supply personnel with adequate amounts of drinking water, food, clothing and other necessities (flash lights). Situations can change rapidly and the projected 12 hour shift can turn into a 24 hour shift. Contingency briefings are also important for “what ifs”. Knowing personnel locations and rallying points is important too. Service members can also be affected by the emergency when their own homes and families become threatened or flooded. Even the armories where they parked their cars at could be a problem when returning home.

Displaced Wild Life, Pets and Farm Animals:

Natural Disasters force the displacement of wild and domestic animals. Stress, unfamiliar surroundings and strangers can change the temperament of normally friendly pets. Some civilians maybe, unwilling to leave their pets behind when being rescued. Wild animals (snakes, raccoons, skunks, coyotes) will seek shelter in unusual places to avoid the rising waters. Farm animals may become stranded. In the case of drowning; herds of cattle/buffalo, horses, pigs/hogs, and chickens can become a biological hazard.

Dealing with Irate Public:

Assisting and evacuating the public can create some unique situations. Some individuals may not cooperate to the point of ignoring roadblocks/barricades and refusing to leave their homes. Some of these individuals may choose to defend their choices with their vehicles or weapons. Service members need to exercise common sense and consult their command when faced with these situations. Beware of mission creep.

PREVENTION MEASURES

First Aid:

First aid, even for minor cuts and burns, is extremely important when exposure to waters potentially contaminated with human, animal, or toxic wastes exists. Immediately clean out *all* open wounds and cuts with soap and clean water. Most cuts, except minor scratches, sustained during flood cleanup activities will warrant treatment to prevent tetanus. If you are injured, contact a physician to determine the necessary type of treatment.

Protective Equipment:

For some work in flooded areas, you will need the following personal protective equipment: hard hats, goggles, heavy work gloves, and watertight boots with steel toe and

insole (not just steel shank). For information on what equipment you need for protection, contact your local safety office.

Excessive noise from equipment such as chain saws, backhoes, tractors, pavement breakers, blowers, and dryers may cause ringing in the ears and subsequent hearing damage. If working with any noise that you must shout over to be heard, you should wear earplugs or other hearing protection devices.

Mosquitoes:

There will be a sharp increase in the mosquito population following the flooding due to standing waters. This is especially important to keep in mind during the later clean up phase. Service members and other workers should be supplied with adequate amounts of insect repellent.

STRESS, LONG HOURS, AND FATIGUE MAY INCREASE THE RISKS FOR INJURY AND ILLNESS:

Continued long hours of work, combined with emotional and physical exhaustion and losses from damaged homes and temporary job layoffs, can create a highly stressful situation for flood cleanup workers. Workers exposed to these stressful conditions (i.e. recovering bodies of drown victims) have an increased risk of injury and emotional crisis, and are more vulnerable to stress-induced illnesses and disease.

Emotional support from family members, neighbors, and local mental health professionals can help to prevent more serious stress-related problems in the difficult months ahead.

People working in all phases of flood cleanup can reduce their risks of injury and illness in several ways:

- Set priorities for cleanup tasks and pace the work over several days (or weeks). Avoid physical exhaustion.
- Resume a normal sleep schedule as quickly as possible. Get plenty of rest and take frequent rest breaks **BEFORE** exhaustion builds up.
- Take advantage of disaster relief programs and services in your community.
- Be alert to emotional exhaustion or strain. When family members and neighbors are unavailable for emotional support, consult professionals at community health and mental health centers.

Working in Confined Spaces:

If you are required to work in a boiler, furnace, pipeline, pit, pumping station, septic tank, sewage digester, storage tank, utility vault, well, or similar enclosure, you should be aware of the hazards of working in confined spaces. A confined space has one or more of the following characteristics:

- limited openings for entry or exit;
- unfavorable natural ventilation; or
- is not designed for continuous worker occupancy.

Toxic gases, a lack of oxygen, or explosive conditions may exist in the confined area, resulting in a potentially deadly atmosphere. Because many toxic gases and vapors cannot be seen or smelled, never trust your senses to determine if safe entry is possible. **Never** enter a confined space unless you have been properly trained, even to rescue a fellow worker! If you need to enter a confined space and do not have the proper training and equipment, contact your local fire department for assistance.

Working On or Near Power Lines:

Several workers have died of electrocution following natural disasters. Workers and employers must take extreme caution while attempting to restore power or clear areas near downed power lines. In one instance, a worker lost his life following Hurricane Hugo after removing trees from a de-energized power line that had been knocked down by the storm. While inspecting the completed work, the man stepped on the line and was electrocuted by "feedback" energy from a portable backup generator at a nearby gas station. Feedback energy occurs when a de-energized line becomes energized by a secondary power source.

A year later, another worker died cleaning branches from a power line, following a tropical storm. He was electrocuted after falling from a tree onto a line thought to be de-energized. Although the workers had opened a fused switch on a transformer, the line remained energized through another transformer.

If you are working on or near power lines, the following steps may save your life:

- Treat all power lines as energized until you have followed the required procedures for personally de-energizing and testing them with an appropriate testing device. Do not rely on "fuzzing" to determine if a power line has been de-energized.
- Verifying that a line is not energized may not ensure your safety. You must also ground lines on both the load and supply sides of the work area. Grounding is necessary to protect you from the hazards of feedback electrical energy from a secondary power source, such as a portable generator.
- When restoring power in underground vaults, added precautions are necessary to avoid explosion hazards. As vaults containing electrical connections are drained or pumped out, and energized, potentially explosive gases may form. If you are

required to work in a utility vault, refer to the Confined Spaces section of this Update.

AGRICULTURAL HAZARDS

If you are involved in cleanup efforts on or near farms, you may face these additional hazards:

Confined Spaces on Farms:

Molding or fermenting agricultural materials in confined spaces may generate large amounts of toxic gases which could cause lung damage or death if inhaled. Turn on fans or blowers in silos and other storage areas at least 30 minutes before entering and leave them on while working. Never open an oxygen-limiting silo if heating is suspected. Also, never enter these areas alone, and always use a full body safety harness.

Respiratory Hazards:

Wet hay, grain, silage, compost, and other organic/agricultural materials often grow large amounts of bacteria and mold during the warm summer weather. Breathing these organisms and the organic dust produced may cause lung disease.

Use proper engineering controls, including adequate fresh air ventilation. When exposure to organic dust cannot be avoided, use NIOSH-certified air-purifying respirators with high efficiency particulate air (HEPA) filters to reduce the risk.

Stored Hay:

Wet hay will mold very quickly. The biological processes involved in the formation of bacteria and mold can cause the hay to undergo spontaneous combustion. Monitor wet hay for odors, hot and damp areas, and rising vapors. If you detect these hazards, remove the wet hay from the building.

If you have any questions, or need additional information, please contact me at the State Safety Office: reginald.packer@ky.ngb.army.mil or call me at 502-607-1281.

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